

ROUND 10

TOSS-UP

1) CHEMISTRY *Multiple Choice* Element A is a nonmetal with an electronegativity value of 3.0 and element B is a nonmetal with an electronegativity value of 2.5. What kind of bonding will occur between these two elements:

- W) nonpolar covalent
- X) polar covalent
- Y) ionic
- Z) fission

ANSWER: X) POLAR COVALENT

BONUS

1) CHEMISTRY *Short Answer* What is the acid anhydride of H_2CO_3 ?

ANSWER: CO_2

TOSS-UP

2) PHYSICS *Short Answer* What is the general term for the kind of material usually placed between the conducting plates of a capacitor?

ANSWER: DIELECTRIC (ACCEPT: INSULATOR)

BONUS

2) PHYSICS *Short Answer* While at Berkeley, Melvin Calvin used this radioisotope to decipher many of the complex processes of photosynthesis:

ANSWER: CARBON 14

TOSS-UP

3) **BIOLOGY** *Short Answer* What morphological scientific name is given to a spherically shaped bacterium?

ANSWER: COCCUS (pronounced: kok'-us)

BONUS

3) **BIOLOGY** *Multiple Choice* Which of the following is MOST accurate for eukaryotic cells:

- W) introns are spliced out of pre-mRNA
- X) introns are spliced out of pre-DNA
- Y) exons are spliced out of pre-mRNA
- Z) exons are spliced out of pre-DNA

ANSWER: W) INTRONS ARE SPLICED OUT OF PRE-mRNA

TOSS-UP

4) **ASTRONOMY** *Multiple Choice* Which of the following is NOT another name for the Pleiades?

- W) M45
- X) the seven sisters
- Y) the false dipper
- Z) the bull's bowl

ANSWER: Z) THE BULL'S BOWL

BONUS

4) **ASTRONOMY** *Short Answer* The work of this Harvard College Observatory scientist made possible the first accurate determination of extragalactic distances by what is often called Henrietta's Law:

ANSWER: HENRIETTA LEAVITT

TOSS-UP

5) MATH *Short Answer* Simplify the following equation: $\frac{7x^2}{x^3}$

ANSWER: $\frac{7}{x}$ (ACCEPT: $7(x)^{-1}$)

BONUS

5) MATH *Multiple Choice* In the hexadecimal counting system, the letter c stands for what base-10 number:

- W) 12
- X) 3
- Y) 16
- Z) 11

ANSWER: W) 12

TOSS-UP

6) EARTH SCIENCE *Multiple Choice* The physical property used in mineral identification for the way a mineral's surface reflects light is called:

- W) streak
- X) polish
- Y) refractivity
- Z) luster

ANSWER: Z) LUSTER

BONUS

6) EARTH SCIENCE *Short Answer* In 1962, Harry Hess at Princeton University hypothesized that the topography of the seafloor could be explained if the seafloor were moving sideways away from the oceanic ridge. This came to be called the Hess hypothesis of:

ANSWER: SEAFLOOR SPREADING

TOSS-UP

7) GENERAL SCIENCE *Multiple Choice* The “Skinner Box” has been most extensively used in the evaluation and study of which of the following:

- W) drugs and behavior
- X) emotions
- Y) social behavior
- Z) neurological assessment of behavior

ANSWER: W) DRUGS AND BEHAVIOR

BONUS

7) GENERAL SCIENCE *Multiple Choice* Which of the following explains why a sailboat can sail into the wind:

- W) Bernoulli's Principle
- X) Pascal's Law
- Y) Archimedes's Principle
- Z) Reynold's Numbers

ANSWER: W) BERNOULLI'S PRINCIPLE

TOSS-UP

8) GENERAL SCIENCE *Multiple Choice* The global address of documents and other resources on the World Wide Web is called the:

- W) USB
- X) UPS
- Y) URA
- Z) URL

ANSWER: Z) URL

BONUS

8) GENERAL SCIENCE *Short Answer* The most common connection point on the motherboard whereby new peripheral devices, such as printers, drives and monitors, can be connected through their respective interface cards is called:

ANSWER: THE EXPANSION BUS (ACCEPT: I/O OR INPUT/OUTPUT BUS)

TOSS-UP

9) CHEMISTRY *Short Answer* Long chains of amino acids are linked together through what type of bond?

ANSWER: PEPTIDE BONDS (ACCEPT: AMIDE BOND) (DO NOT ACCEPT: POLYPEPTIDE)

BONUS

9) CHEMISTRY *Short Answer* A patient in the Emergency Room required 20 grams of a clot-busting drug based on his body weight of 150 pounds. The weight per volume (w/v) of the drug solution is 10%. How many milliliters of the drug solution should be administered?

ANSWER: 200 MILLILITERS (ACCEPT: 200mL)

(Solution: 20 g drug x 100 mL/10 g = 200 mL)

TOSS-UP

10) PHYSICS *Multiple Choice* For particles that have mass, such as electrons, quantum theory gives the relationship of wavelength to momentum by which of the following formulas, where c is the speed of light, v is the particle's speed, h is Planck's constant, m is the particle's mass, and f is frequency:

- W) wavelength = mc^2
- X) wavelength = c / f
- Y) wavelength = h / mv
- Z) wavelength = hf

ANSWER: Y) WAVELENGTH = H /MV

BONUS

10) PHYSICS *Short Answer* A bullet of mass m travelling at velocity v has a kinetic energy of $\frac{1}{2}mv^2$ when it strikes a ballistic pendulum of mass 1000 grams. The kinetic energy of the two masses moving together just after the moment of impact is about a thousand times smaller than $\frac{1}{2}mv^2$. What has most of the bullet's initial kinetic energy been converted to?

ANSWER: HEAT

TOSS-UP

11) **BIOLOGY** *Multiple Choice* The tectorial membrane is found in which of the following anatomical structures of a human:

- W) inner ear
- X) eye
- Y) testes
- Z) ovaries

ANSWER: W) INNER EAR

BONUS

11) **BIOLOGY** *Short Answer* What is the name of a graffian follicle after it releases an egg, turns into a yellow body, and begins to secrete progesterone?

ANSWER: CORPUS LUTEUM

TOSS-UP

12) **ASTRONOMY** *Multiple Choice* Which of the following is a pulsating variable star whose brightness varies in a very regular time period of about 1-50 days:

- W) Lyrae star
- X) Cepheid
- Y) Mira star
- Z) Cannon Star

ANSWER: X) CEPHEID

BONUS

12) **ASTRONOMY** *Short Answer* What term is most commonly used to refer to the actual motion that stars have in relation to each other, and over many years will lead to changes in the shapes of constellations?

ANSWER: PROPER MOTION

TOSS-UP

13) MATH *Multiple Choice* Find x if the $\log_5(x) = -2$ (read as: log base 5 of x equals negative 2)

- W) 0.04
- X) 0.06
- Y) 0.08
- Z) 0.09

ANSWER: W) 0.04

(Solution: $5^{-2} = x$)

BONUS

13) MATH *Short Answer* What is the greatest common divisor for the numbers 102 and 30?

ANSWER: 6

TOSS-UP

14) EARTH SCIENCE *Multiple Choice* Which of the following minerals best illustrates the property of cleavage:

- W) quartz
- X) chrysotile
- Y) pyrite
- Z) mica

ANSWER: Z) MICA

BONUS

14) EARTH SCIENCE *Multiple Choice* Which of the following is an example of a metamorphic rock:

- W) gneiss (pronounced: nice)
- X) granite
- Y) sandstone
- Z) limestone

ANSWER: W) GNEISS

TOSS-UP

15) GENERAL SCIENCE *Multiple Choice* As more of the water turns into ice, the temperature of the remaining liquid in a vessel:

- W) decreases
- X) can not be determined from the available information
- Y) increases
- Z) remains the same

ANSWER: Z) REMAINS THE SAME

BONUS

15) GENERAL SCIENCE *Short Answer* What were the two most valuable products derived from the tree *Castanea americana* ?

ANSWER: CHESTNUTS AND WOOD (ACCEPT: FOOD AND WOOD)

TOSS-UP

16) GENERAL SCIENCE *Short Answer* There are several types of these systems commonly used in intranets designed to prevent unauthorized access by internet users to or from a private network:

ANSWER: FIREWALL

BONUS

16) GENERAL SCIENCE *Multiple Choice* Which was the first Intel microprocessor introduced in 1982 to break the 1 megabyte limit?

- W) 8086
- X) 80286
- Y) 80186
- Z) 80386

ANSWER: X) 80286

TOSS-UP

17) CHEMISTRY *Multiple Choice* Which of the following is a nonpolar molecule:

- W) HCl
- X) NaCl
- Y) CaCl
- Z) H₂

ANSWER: Z) H₂

BONUS

17) CHEMISTRY *Short Answer* Knowing that the molar mass of phosphoric acid (H₃PO₄) is 98, calculate its equivalent weight rounded off to the nearest whole number:

ANSWER: 33 (ACCEPT: 32.7 GRAMS/EQUIVALENTS)

(Solution: 98.0 grams/3 H⁺ equiv = 32.7 g/equiv)

TOSS-UP

18) PHYSICS *Multiple Choice* Certain products have been designed so that people wearing headphones do not hear the objectionably loud sound from certain machinery with which they are working. These headphones most likely work based on which one of the following principles:

- W) doppler effect
- X) destructive interference
- Y) constructive interference
- Z) audiopolarization

ANSWER: X) DESTRUCTIVE INTERFERENCE

BONUS

18) PHYSICS *Short Answer* In the 19th century, this Scottish scientist showed that all magnetic and all electric phenomena could be described by four equations that often bear his name. What is his name?

ANSWER: JAMES CLERK MAXWELL (ACCEPT: MAXWELL)

TOSS-UP

19) **BIOLOGY** *Multiple Choice* Plants gather wavelengths of light NOT absorbed by the main chlorophyll a and b through:

- W) photosystem I
- X) photosystem II
- Y) accessory pigments
- X) carotenoids

ANSWER: Y) ACCESSORY PIGMENTS

BONUS

19) **BIOLOGY** *Short Answer* Which white blood cell is typically known as the body's first line of defense:

ANSWER: NEUTROPHIL (ACCEPT: POLYMORPHONUCLEAR LEUKOCYTE OR PMN))

TOSS-UP

20) **ASTRONOMY** *Multiple Choice* What is the astronomical term for the successive dimming of light as it moves through space:

- W) interstellar extinction
- X) refraction
- Y) rarefraction
- Z) blotting

ANSWER: W) INTERSTELLAR EXTINCTION

BONUS

20) **ASTRONOMY** *Short Answer* What is the constant called that is the average flux of the Sun's energy arriving at the Earth:

ANSWER: SOLAR CONSTANT

TOSS-UP

21) MATH *Multiple Choice* Using an x-y coordinate axis, a parabola is represented by the equation $x^2 = 6y$. The vertex of this parabola is at what coordinate point:

- W) (0, 0)
- X) (1, 1)
- Y) (1, 2)
- Z) (2, 2)

ANSWER: W) (0, 0)

BONUS

21) MATH *Short Answer* What is the midpoint of the line segment joining points (4, -2) , (-3, 7) (read as: parentheses 4, comma, negative 2, close parentheses, parentheses negative 3, comma, 7, close parentheses)?

ANSWER: (1/2, 5/2)

(Solution: $(X_1 + X_2)/2$, $(Y_1 + Y_2)/2$)

TOSS-UP

22) GENERAL SCIENCE *Multiple choice* The term empirical is most accurately described as a conclusion based on:

- W) intuition
- X) careful theoretical propositions
- Y) extrapolating from the specific to the general
- Z) experimentation and observation

ANSWER: Z) EXPERIMENTATION AND OBSERVATION

BONUS

22) GENERAL SCIENCE *Short Answer* Order the following elements in dry weight per cent make-up in the human body, from the HIGHEST percent to the LOWEST percent content: Calcium; Nitrogen; Carbon; Magnesium:

ANSWER: CARBON; NITROGEN; CALCIUM; MAGNESIUM

(Solution: C=61.7%, N=11.0%, Ca=5.0%, Magnesium 0.3%)

TOSS-UP

23) CHEMISTRY *Multiple Choice* If a human being were to be exposed suddenly to the surface of Mars, which of the following would most likely occur to the person's blood:

- W) it would boil in a matter of seconds
- X) it would freeze in a matter of seconds
- Y) it would coagulate in a matter of seconds
- Z) there would be no immediate change

ANSWER: W) IT WOULD BOIL IN A MATTER OF SECONDS

BONUS

23) CHEMISTRY *Short Answer* How many milliliters of water would you add to 100 milliliters of a 0.350 molar solution to make a 0.100 molar solution?

ANSWER: 250 MILLILITERS

(Solution: $C_i V_i = C_f V_f$; $(0.35)(100) = (0.1)(V_f) = 350$; $350\text{ml} - 100\text{ml} = 250\text{ml}$)

TOSS-UP

24) PHYSICS *Multiple Choice* Which of the following is the most accurate reason why a light bulb dropped on a rug does not break, but when dropped on a tile floor it does break:

- W) the time it takes to stop moving is less for the tile
- X) the change in momentum is greater for the tile
- Y) the light bulb weighs more when it hits the tile
- Z) the change in momentum is greater for the rug

ANSWER: W) THE TIME IT TAKES TO STOP MOVING IS LESS FOR THE TILE

BONUS

24) PHYSICS *Short Answer* When Thomas Edison was promoting the wide use of direct current, this personal enemy of Edison's was the chief proponent and expert in alternating current:

ANSWER: NIKOLA TESLA

TOSS-UP

25) BIOLOGY *Multiple Choice* Which of the following is not caused by a virus:

- W) mumps
- X) yellow fever
- Y) small pox
- Z) leprosy

ANSWER: Z) LEPROSY

BONUS

25) BIOLOGY *Short Answer* What is the botanical name for the horizontal stems that allow a plant to spread underground?

ANSWER: RHIZOMES